

V.M. MIKHELEV, D.S. BATISHCHEV, A.A. UTYANSKIY, E.S. SOJNIKOVA

METHOD FOR SEGMENTATION OF BLOOD SHAPED ELEMENTS ON MICROSCOPIC MEDICAL IMAGES

The article discusses the solution to the problem of erythrocytometry using computer vision methods. The main problem with calculating the areas of red blood cells is that they can overlap with each other. A combined approach is proposed for extracting contour evidence, which is based on the detection of concave points using curvature analysis, the use of concavity testing and an efficient search procedure. It is then suggested to use the segment grouping method to find a group of path segments that together form an elliptical object. Segment grouping involves iterating over preselected contour segments in order to be able to combine them into a single closed object. The above testing of the segmentation algorithm for overlapping erythrocytes on microscopic images showed the effectiveness of the developed method.

Keywords: erythrocytometry; segmentation; microscopic images; blood cells; overlapping objects.

[1].

[2].

[3]

[4].

[5].

[6].

[7].

[8].

[8].

(ADD),

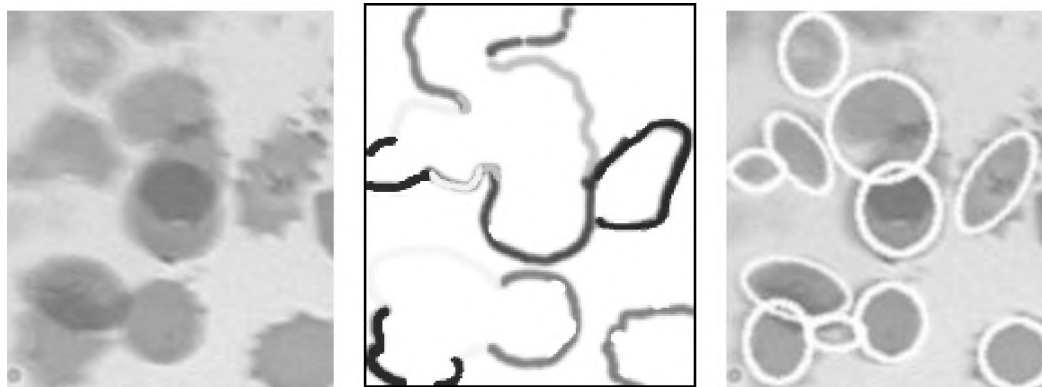
[6].

ADD

ADD

[10],

1



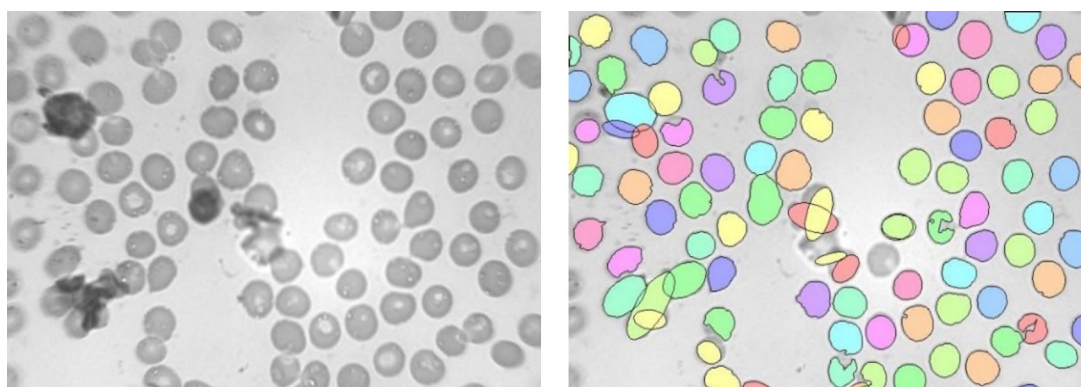
1 -) : () ;) ;

24

4

2

3-



2 -) - ;) - 3- 3,7 :

19-07-00133

1. // , 2004. - 215 .
2. // . - 2018. - . 45. 3. . 537-546.
3. Otsu N. A threshold selection method from gray-level histograms // IEEE Trans. Sys., Man., Cyber.: journal. - 1979. - Vol. 9. - P. 62-66.
4. // . 2018. . 3. . 54-65.
5. . 2016. , 1(3): 4-9.
6. Zhang, W.H., Jiang, X., Liu, Y.M.: A method for recognizing overlapping elliptical bubbles in bubble image. Pattern Recognition Letters (2012) 33(12), 1543-1548.
7. He, X., Yung, N.: Curvature scale space corner detector with adaptive threshold and dynamic region of support. In: Proceedings of the 17th International Conference on Pattern Recognition. ICPR 2004. (Volume 2). 791-794.
8. Zafari S., Eerola T., Sampo J., Kalviainen H., Haario H. Segmentation of partially overlapping nanoparticles using concave points. In: Advances in Visual Computing, Springer, 2015, 187-197.
9. Zafari S., Eerola T., Sampo J., Kalviainen H., Haario H. Comparison of concave point detection methods for overlapping convex objects segmentation. In: 20th Scandinavian Conference on Image Analysis. SCIA 2017, June 12-14, 2017, 245-256.
10. Fitzgibbon, A., Pilu, M., Fisher, R.B. Direct least square fitting of ellipses. IEEE Transactions on Pattern Analysis and Machine Intelligence 21 (1999) 476-480.

..
.: +7(4722) 30-13-53
E-mail: mikhelev@bsu.edu.ru

..
.: +7(4722) 30-13-53
E-mail: batishchev@bsu.edu.ru

..
.: +7(4722) 30-13-53
E-mail: utyanskiy@bsu.edu.ru

..
.: +7(4722) 30-13-53
E-mail: 831468@bsu.edu.ru